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Bone mineral density in Mexican trans women
Densidad mineral ósea en mujeres trans mexicanas

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Abstract:

Introduction: Trans people represent a vulnerable group, and their health conditions are poorly understood. A trans woman is a person who, at birth, has the biological sex of a man but identifies and expresses herself as feminine. Objectives: to evaluate bone mineral density (BMD) and its associations with health habits and body composition in Mexican trans women (TW). Material and methods: A cross-sectional study was conducted with a convenience sample of thirty trans women, residents of Toluca City, Mexico. BMD was evaluated by densitometry (DXA) and body composition by electrical bio-impedance, using reference values for Mexican-American men. A questionnaire on socio-demographic characteristics, physical activity, health-related habits, and use of gender-affirmative hormone therapy was applied. Results: The mean age of the participants was 28 years (SD = 6.9); 20% of the participants had low BMD. Low socioeconomic status was related to lower BMD in the hip (p = 0.043). The trans women with heavier bodies had a higher BMD in the spine (for weight, p = 0.004; for fat mass, p = 0.047; for fat-free mass, p = 0.004); furthermore, fat-free mass was associated with higher BMD in the hip (p = 0.050). No statistically significant relationships were found with other variables. Conclusions: Trans women had low BMD, which was associated with economic difficulties.

Keywords:

Bone density; body composition; transgender individuals; socioeconomic factors

Resumen:

Introducción: Las personas trans representan un grupo vulnerable y sus condiciones de salud son poco explorados. Una mujer trans es una persona que al nacer tiene sexo biológico de un hombre, pero se identifica y expresa como femenina. Objetivos: evaluar la densidad mineral ósea (DMO) y su asociación con hábitos para la salud y composición corporal en mujeres trans mexicanas (MT). Materiales y métodos: Se realizó un estudio transversal con una muestra por conveniencia de treinta MT, residentes de la ciudad de Toluca, México. Se evaluaron DMO mediante densitometría (DEXA) y composición corporal por bio-impedancia eléctrica, tomando como referencia los valores para varones mexicoamericanos. Se aplicó un cuestionario sobre características sociodemográficas, actividad física, hábitos relacionados con la salud y el uso de terapia hormonal de afirmación de género (GAHT). Resultados: La media de edad para las participantes fue 28 años (DE = 6,9); el 20% de las participantes tuvieron DMO baja para la edad. El nivel socioeconómico bajo se relacionó con menor DMO en cadera (p = 0,043). Las MT con cuerpos más robustos tuvieron una mayor DMO en columna (para peso, p = 0,004; para masa grasa, p = 0,047; para masa libre de grasa, p = 0,004); además, la masa libre de grasa se asoció con una mayor DMO de cadera (p = 0,050). No se encontraron relaciones estadísticamente significativas con otras variables del estudio. Conclusiones: Las mujeres trans tuvieron DMO baja, que se asoció con dificultades económicas.

Palabras Clave:

Densidad ósea; composición corporal; mujeres trans; factores socioeconómicos

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INTRODUCTION

In transsexual (trans) individuals, the biological sex is not congruent with their gender identity and expression.[1] In the USA, it was estimated that 0.52% of people identified themselves as trans, while in Europe, approximately 0.5-0.9% of the population were reported to be trans people.[2-4] In Mexico, 0.9% of adults are transgender men or women, which is equivalent to more than 900,000 people.[5]

Bone mineral density (BMD) indicates the level of bone mineralization, and its decrease is associated with a higher risk of presenting bone fractures in old age. Hip fractures can be associated with limited autonomy and lower quality of life.[6] Despite the relevance of this topic, there is not enough information regarding the possible health problems related to BMD in trans women (TW).

At the international level, some cross-sectional and longitudinal studies have been conducted on BMD in TW and its association with gender-affirming hormone therapy (GAHT). In studies and reviews it has been reported that TW tend to have a lower BMD than cis men (whose biological sex is congruent with gender identity and expression), even before starting GAHT.[7-11] It has been suggested that the lower BMD in TW may be because they do less physical activity, have less muscular development, and have a higher risk of hypovitaminosis D.[7,8,10,12] In Belgium, 26% of TW presented a BMD below the expected range for their age in the spine and 2% in the hip.[13] Likewise, among TW, the density of trabecular bone was positively associated with the use of GAHT. [14] In contrast to the previous studies, Fighera et al. in a systematic review and meta-analysis, have found no significant difference in BMD between TW and cis men. [15]

In one study, it was estimated that 12% of the TW participants had thromboembolic and cardiovascular events during the use of GATH.[16] In this population, cardiovascular risk was associated with the use of ethinylestradiol.[16] However, some authors suggest that GAHT should not be suspended since it works as a protector to prevent a decrease in BMD or osteoporosis. [17,18]

Currently, no studies exist in Mexico and most Latin American countries (except Brazil and Argentina) about BMD in TW. Some authors have suggested that it is necessary to carry out studies to identify possible risk factors related to decreased BMD in MT.[10,15,18] Taking the above into consideration, the objective of this study was to evaluate BMD and its association with health-related habits and body composition in Mexican TW.

MATERIALS AND METHODS

A cross-sectional study was conducted with a convenience sample of thirty TW 18 to 50 years old, residents of Toluca City, Mexico. All of them were or have been sex workers. Participants completed a questionnaire on a digital tablet. Subsequently, BMD and body composition were assessed. DXA assessment was not conducted in one participant; therefore, she was excluded from the analysis reported herein. Thus, of the 32 women, only one did not have completed data; therefore, the response rate was 97%.

This study has been carried out following the Code of Ethics of the Declaration of Helsinki.[19] The participants were assured of the confidentiality of the data, and their participation was voluntary. Written informed consent was obtained from participants. The ethical aspects of the project were granted by the Divisional Board of Biological and Health Sciences of the *Universidad Autónoma Metropolitana Xochimilco*.

Through a questionnaire, data such as age, socioeconomic status, and education level were collected. To evaluate the socioeconomic level, the following question was used with four response options “Would you say that money: 1) is enough for you/ you can save money, 2) It is just sufficient for you /without great difficulties, 3) It is not enough for you/you have difficulties, 4) It is not enough for you/you have great difficulties”. From the previous options, two groups were formed: a) the participants who answered the first two options and b) those who answered the last two options. The second group was considered to experience food insecurity, which occurs when people do not have the financial resources to purchase healthy foods.[20]

The participants were asked how many times per week they did at least 30 minutes of physical activity. TW who engaged in less than 150 minutes of physical activity per week were classified as physically inactive.[21]

To assess health-related habits, questions about alcohol and tobacco consumption were asked. For alcohol consumption, three questions were applied: “Have you ever consumed alcoholic beverages?”, “In the last 12 months, did you drink any alcoholic beverage (beer, pulque, brandy wine, whiskey, rum, tequila, coolers, etc.)?”, and “How often in the last 12 months did you usually drink any type of alcoholic beverage?” with 12 possible answers. In addition, the number of drinks or glasses per occasion was asked. Two groups were formed: a) regular alcohol consumption (five or more drinks per occasion at least once a week) and b) non-regular alcohol consumption.[22] To assess tobacco use, three questions were asked: “Have you ever tried cigarettes?”, “How many days a week did you smoke cigarettes during the last 30 days?”, and “How many cigarettes do you smoke per day”? Two groups were created: those who consumed less than five cigarettes and those who smoked more than five cigarettes a day.

To evaluate the use of GAHT, the following question was asked: “Are you currently using GAHT?”. The age of starting GAHT

was asked. Based on the above, two groups were distinguished: a) those who were taking hormones at the time of the study and b) those who were not taking hormones at the time of the study.

BMD was measured by dual-energy X-ray absorptiometry (DXA), using a Discovery Wi densitometer, Hologic. Low BMD was defined as Z-score ≤−2.0 according to DXA criteria and using reference values for Mexican American men.[23] Estimates were obtained using the software of the equipment version 13.5.

To estimate the visceral fat in the TW, electrical bioimpedance was performed in a body composition analyzer (Tanita brand, IRONMAN RD-545IM model). Weight was measured with the same equipment. The standardized Frankfort technique was used to measure the participants' height, using a stadiometer Seca model 216.[24]

For data analysis, continuous variables were shown as means ± standard deviations (SD). The comparisons between groups of quantitative variables were obtained using Student's t test. Using univariate and multivariate linear regression models, associated factors with BMD were identified. A value p <0.05 was considered as significant. The analysis was performed using the Stata 14 software (StataCorp, USA).

RESULTS

The mean age of the participants was 28 years old (SD = 6.9), with a range between 18 and 50 years. 55.2% considered that money was not enough, and they had difficulties; more than half of the participants (53.3%), had only basic education (primary and secondary); and 37.9% experienced discrimination in health services (Table 1). Most of the participants (86.6%) had been users (by self-medication) of GAHT, whereas one third used hormones at the time of the study and 13.4% had not used them.

Regarding lifestyle habits, 86.7% reported excessive alcohol consumption, while 93.3% had used tobacco. 86.2% of the participants were obese according to body fat percentage, and only 25% endorsed the physical activity recommendation.

The mean BMD Z-score in the spine was -1.11 and in the hip -0.19; and the average absolute BMD was 0.963 and 0.926, respectively (Table 2). Although the mean for BMD does not show levels below the lower limit (<-2.00 SD), low values were found in individual data in 20% of the participants, as well as a tendency to present low BMD for age. The mean percentage of fat (28.4%, SD = 5.2) was above normal. Fat-free mass was 51.6 kg (SD = 7.5). The amount of visceral fat was within normal limits.

Table 1. Descriptive characteristics of Mexican trans women (n=30)

Variables	n	%
Socioeconomic level		
Can save money/ having enough	14	44.8
Is not enough/having difficulties	16	55.2
Education level		
Basic education	16	53.3
Upper secondary education/and more education	14	46.7
Experiences of discrimination		
No	19	62.1
Yes	11	37.9
GAHT* at the time of the study		
No	21	70.0
Yes	9	30.0
Onset of GAHT (age)		
Have not taken	4	13.4
<18	5	16.6
≥18	21	70.0
Excessive alcohol consumption (≥ 5 drinks/occasion)		
No	4	13.3
Yes	26	86.7
Tobacco use		
No	2	6.7
Yes	28	93.3
Fat percentage		
Normal	5	13.8
Obesity	25	86.2
Physical activity		
< 150 min / week	23	75.0
≥ 150 min / week	7	25.0

* GAHT, Gender-Affirmative Hormone Therapy.

Table 2. Characteristics of body composition and BMD of Mexican trans women (N=29)*

	Mean	SD	Minimum	Maximum
Age (years)	28.4	6.9	18	50
Height (cm)	170.5	7.6	153	189
Weight (kg)	76.7	14.4	40.8	99.2
Body mass index (kg/cm^2)	26.2	3.8	17.4	32.7
Fat mass (%)	28.4	5.2	16.3	39.6
Fat free mass (kg)	51.6	7.5	32.3	62.7
Visceral fat (cm^2)	8.2	3.9	1.0	18.5
BMD spine (g/cm^2)	0.963	0.130	0.660	1.263
BMD hip (g/cm^2)	0.926	0.225	0.511	1.538
BMD spine (Z score)	-1.11	1.21	-3.90	1.60
BMD hip (Z score)	-0.19	1.57	-3.50	3.10

The TW that reported having economic difficulties presented a lower BMD than those that did not have these difficulties (p = 0.043), Table 3. In addition, lower values in the hip BMD were found in participants with a lower percentage of fat (p = 0.072).

Table 3. Comparison of spine and hip BMD means according to studied variables in Mexican trans women (n=29)

	BMD spine (Z score)		BMD hip (Z score)	
	Mean	p	Mean	p
Socioeconomic level				
Can save money/having enough	-1.169	0.687	0.415	0.043
It is not enough/having difficulties	-0.947		-0.607	
Education level				
Basic education	-1.300	0.188	-0.163	0.545
Upper secondary education /more education	-0.892		-0.232	
Experiences of discrimination				
No	-1.147	0.298	0.135	0.136
Yes	-0.900		-0.545	
GAHT at the time of the study				
No	-1.135	0.545	-0.300	0.701
Yes	-1.078		0.043	
Alcohol consumption				
Not excessive	-1.450	0.281	-0.050	0.424
Excessive (≥ 5 drinks/occasion)	-1.06		-0.216	
Tobacco use				
Does not use	-1.058	0.158	-0.092	0.220
Less than 5 cigarettes	-1.573		-0.755	
More than 5 cigarettes	-0.400		0.632	
Fat percentage				
Normal	-1.875	0.131	-1.200	0.072
Obesity	-0.913		0.045	
Physical activity				
< 150 min / week	-1.135	0.454	0.300	0.299
≥ 150 min / week	-1.078		0.043	

GAHT, Gender-Affirmative Hormone Therapy.

In the linear regression models (Table 4) it was observed that lower socioeconomic status was marginally associated with lower hip BMD for age (p = 0.086). The TW with more robust bodies had a higher BMD in the spine (weight, p = 0.04; fat mass, p = 0.047; fat-free mass, p = 0.004). Fat-free mass was associated with higher hip BMD (p = 0.050).

Considering the above results, a multivariate model was estimated for hip BMD, including socioeconomic status and fat-free mass as independent variables (data not shown in a table). Low socioeconomic status was marginally related to lower hip BMD (B = -1.055, p = 0.082, r^2 = 12.4%), while fat-free mass was not related to BMD (B = 0.018, p = 0.518).

DISCUSSION

In the present investigation, 20% of the trans women had low BMD and the mean BMD Z-scores for the spine and hip were below the levels expected for their age. This is consistent with previous studies showing that TW, even before the start of any hormonal intervention, already have lower bone mass, a higher frequency of osteoporosis, and smaller bone size than cis men.[9-11,18,25] However, it has also been reported that the average BMD in the hip and spine of TW does not differ from that of cis men.[15] Taken together, these results suggest that spine and hip BMD can often be low in TW, which is concerning for its potential consequences.[6]

The mean age of the studied women was 28 years old. In Mexico, in most of the studies carried out among TW, the average age is usually less than 30 years. The foregoing may be related to the prevailing machismo in Mexico and transphobic hate crimes according to national LGBTIQ+ discrimination surveys.[26]

Table 4. Bivariate regression models between BMD and studied variables in trans women (n=29)

Variables	BMD spine (Z score)			BMD hip (Z score)		
	B	*p*	r^2 (%)	B	*p*	r^2 (%)
Socioeconomic level						
It is not enough/having difficulties	0.223	0.626	0.9	-1.023	0.086	10.9
Education level						
Upper secondary education / more education	0.408	0.376	2.9	-0.069	0.909	0.0
Discrimination (yes)	-0.680	0.272	4.6	-0.680	0.272	4.6
Weight	0.042	0.040	10.6	0.028	0.176	0.0
Fat mass (DXA), kg	0.043	0.047	13.8	0.018	0.542	1.4
Fat free mass (DXA), kg	0.073	0.004	26.6	0.068	0.050	13.5
Tobacco						
Less than 5 cigarettes	-0.514	0.301	6.6	-0.663	0.314	11.0
More than 5 cigarettes	0.658	0.270		0.723	0.358	

B, regression coefficient; r^2, determination coefficient.

It should be noted that both in our sample and in other samples, the Mexican TW have been characterized by having low education, in addition to low or insufficient income to cover their basic needs.[27,28] In the present study, the TW that reported having a low economic income (55.2%) had a lower hip BMD. There are no other studies with TW where the socioeconomic level has been related to BMD. A possible association between BMD and socioeconomic level has been observed in the general population.[29] Being poor implies having a monotonous and poorly nutritious diet. Specifically, households with food insecurity have less access to foods that are sources of calcium and vitamin D, such as dairy products and meat.[20]

In Mexico, TW tend to have a low education, which is associated with a lower economic income.[30] Low education in Mexican TW has been linked to early abandonment of the home and experiences of discrimination and harassment in the school.[26] TW are discriminated against in formal work settings and this discrimination forces them to insert themselves in informal jobs, sometimes leaving commercial sex work as their only option.[31] At the time of the study, most of participating TW were engaged in commercial sex work.

Among the TW of the present study, 38% reported having experienced discrimination and/or difficulties in accessing health services. According to other studies carried out in Mexico, Colombia, and the US, these experiences of discrimination prevent trans people from receiving timely and quality medical care.[26,31-34] Trans people suffer more discrimination that other groups of LGBTIQ+ population.[26]

In the present investigation, no relationship was observed between the use of GAHT and BMD. This may be influenced by the lack of detailed information regarding the dose and time of

use, as well as by problems of self-medication and sample size. Most participants reported using GAHT (86%); however, they did not remember the dose and treatment schedule. In a systematic review and meta-analysis, it has been observed that one year after the use of GAHT, BMD in the spine and hip improved significantly.[15]

In the Mexican TW who participated in our study, weight, fat, and fat-free mass were associated with higher BMD in the hip and spine in the bivariate analysis, however the significance disappeared when adjusting for food insecurity. Body weight can act as a mechanical stimulus on the bone structure, which promotes calcium attrition.[35] It is important to point out that more than half of the TW from Toluca were obese.

In this study, no associations were found between BMD and variables related to lifestyle, although the prevalence of excessive alcohol and tobacco consumption was high in the participants (86.7% and 93.3%, respectively). The high prevalence of alcohol and tobacco consumption has been observed in other samples of trans people.[15,18] However, in this study, no associations were found between BMD and variables related to health habits.

Within the study's limitations, it is important to mention that the TW sample was limited, and hormonal self-medication does not allow a comparison of our results with other studies. In future studies, it is necessary to recruit a larger sample of Mexican TW with standardized GAHT schemes to measure serum levels of sex hormones. Given that among Mexican TW the use of medicines is usually recurrent and without medical prescription, future research should analyze its possible relationship with BMD and changes in body composition. The study of these risk factors should consider the social determinants of health.

In summary, our study shows that TW tend to have low levels of BMD in the spine and hips. In addition, economic difficulties were related to lower BMD in the hip. These results show spaces of opportunity to promote better living and health conditions in this socially vulnerable population. An important proportion of TW presented unhealthy lifestyle habits, such as alcohol and tobacco consumption and low physical activity levels. Health promotion and education programs are required that would consider the context of this group and will be aimed at facilitating self-care.[36]

Regarding health care, a significant proportion of TW have experienced discrimination in these services. It is likely that health staff do not respect the gender identity of TW and do not consider the specific issues of this group.[36] In the future, it should be verified that the protocols developed for the health care of the LGBTQ+ population will be implemented.[34] The generation of more studies and interventions that allow timely access of TW to bone health monitoring should be considered.

In Mexico, there is almost no research on the health issues of TW (beyond HIV infection). Therefore, monitoring different indicators of well-being could reveal areas to improve their quality of life. Promoting research in this population could lead to specific recommendations in health and nutrition.

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